

AMARANTHUS ACANTHOBRACTEATUS (AMARANTHACEAE)

James Henrickson

Department of Biology
California State University
Los Angeles, California 90032, U.S.A.
henrickson@mail.utexas.edu

ABSTRACT

Amaranthus acanthobracteatus is described as a new species from the sand dunes at Bilbao near Viesca in southern Coahuila, Mexico. It is a sister species to the dioecious *A. acanthochiton*, that has been recognized as a distinct genus *Acanthochiton*. Both species are psammophytic, dioecious annuals with large chartaceous, sharp-pointed pistillate bracts. The new taxon differs from *A. acanthochiton* in its longer, less cordate, distally recurved pistillate bracts, its larger seeds, larger pistillate inflorescences, and in many minor characteristics. The new species also is larger, with pistillate plants maturing as tumbleweeds.

RESUMEN

Se describe *Amaranthus acanthobracteatus* como especie nueva para la ciencia, de las dunas de arena de Bilbao, cerca de Viesca, en el sur de Coahuila, México. Representa una especie hermana de *A. acanthochiton*, especie dioica que ha sido segregada en un género distinto, *Acanthochiton*. Ambas especies son anuales, dioicas y psamófilas, y ambas presentan las brácteas pistiladas grandes, cartáceas y puntiagudas. El taxon nuevo se distingue de *A. acanthochiton* por las brácteas pistiladas más largas, menos cordadas, y recurvadas distalmente, por las semillas más grandes, por las inflorescencias pistiladas más grandes y por muchas características de índole menor. Además, las plantas de la especie nueva son más grandes y, al madurar y secarse, las plantas pistiladas son dispersadas por el viento.

INTRODUCTION

Dioecious *Amaranthus* species are native to North America. They initially were treated in the genera *Acnida* L. (with narrow pistillate bracts and 0-5 pistillate sepals) and *Acanthochiton* Torr. (with very large, conduplicate, chartaceous pistillate bracts) (Bentham & Hooker 1880; Standley 1917; Schinz 1934) until Sauer (1955) combined both genera with the monoecious *Amaranthus* species. Sauer (1957) noted that hybrids between the taxa previously in *Acnida* resulted in fertile offspring (Murray 1940), while hybrids between the *Acnida* group and monoecious *Amaranthus* species formed sterile hybrids, this implying that the *Acnida* taxa may represent a distinct phylad. However, Murray (1940) found that hybrids between species of monoecious *Amaranthus* often produced sterile hybrids as well. The relationship of *Acanthochiton* to the other dioecious taxa has not been specifically addressed. While some regional floras have continued to recognize *Acnida* and *Acanthochiton* as a distinct genera (Correll & Johnston 1970; Martin & Hutchins 1980) their combination with *Amaranthus*

has been recognized in the Flora North America series (Mosyakin & Robinson 2003). While *Acanthochiton*, initially appears distinct from *Amaranthus*, Sauer (1955) points out that the differences are only quantitative and that the staminate plants of the taxon are very similar to those of *Acnida* species. Thus Sauer (1955) placed *Acanthochiton wrightii* Torr. into *Amaranthus*. Due to the existence of a previously published *Amaranthus wrightii* S. Wats., he made the combination *Amaranthus acanthochiton* (Torr.) Sauer.

In this paper, I present a second species related to *Amaranthus acanthochiton* from the Bilbao Dunes near the town of Viesca in southern Coahuila.

TAXONOMY AND DISCUSSION

Amaranthus acanthobracteatus Henrickson, sp. nov. (Figs. 1, 2). TYPE: MEXICO. COAHUILA: ca. 37 air mi ESE of Torreon on sand dunes at Bilbao, (8 mi NW of Viesca); dioecious; female plant 8 × 18 dm tall-wide with the stems dense, male plant 7 × 10 dm, with stems more erect and open; 25° 25'33.6"N, 102° 53'33.3"W, 3650 ft. elev., 13 Nov 2002, Henrickson 23209 (HOLOTYPE: TEX; ISOTYPES: MEXU and to be distributed).

Amaranthus acanthochiton (Torr.) Sauer primo ad aspectu maxime simile. sed bracteis feminis ad maturitatem angustatis basin versus (non cordatis basi), spinis ad apicem bracteae recurvatis, non rectispinis, bracteis tenuibus, non incrassatis, sine reticulis lateribus. seminibus grandioribus 1.7–2.2 (versus 1.2–1.4) mm longis, et dichasiis magnioribus, et amplioribus magnitudinibus plantis differt.

Dioecious, depressed-globose, coarse annuals of sand-dune habitats. Pistillate plants densely branched, to 4–9 dm tall, 9–18 dm wide; central stems erect, to 20 mm in diameter at the base; internodes 3–13 cm long, branching alternately throughout; young stems 1–1.5 mm in diameter, striate, mottled green between the ± 10 yellowish ribs. Staminate plants 3.5–9 dm tall, 4–15 dm wide, with more vertical stems to 8 mm in diameter developed from basal decumbent stems. Leaves of pistillate and staminate plants similar; basal leaves linear-lanceolate, 5–8(–10) cm long, 5–8(–10) mm wide, ascending, obtuse to acute, apiculate at the tip, cuneate at the base; petioles 10–20(–30) mm long; upper-inflorescence leaves more linear, 1–5 cm long, 1–5 mm wide, the margins of all leaves strongly crisped, whitish, the primary-secondary veins whitish beneath. Pistillate plants with flowers axillary to the linear mid- upper-stem leaves, in irregular, dichasial inflorescences that eventually develop into an elongated cluster of ± overlapping bracts to 25 mm long, the inflorescences dichasial at the base, with the two axes usually not branching above, the large, ovate, strongly folded bracts obscuring the upper inflorescence arrangement, the lowest bracts smallest, to 5 mm long, 3 mm wide, the mid bracts largest, 10–16.5 mm long, to 10 mm wide, the distal, youngest bracts ± reduced, 8–12 mm long, the bracts thickened, V-shaped in transverse section, with the midvein straight or outwardly curved, with the sharp tips reflexed, the bracts rounded, cordate only with age at the base, broadest in the lower half, and tapering to the tip, the adaxial bract surface white throughout, the abaxial (outer) bract surface white along the base, the mid and distal portions green, not conspicuously veined,

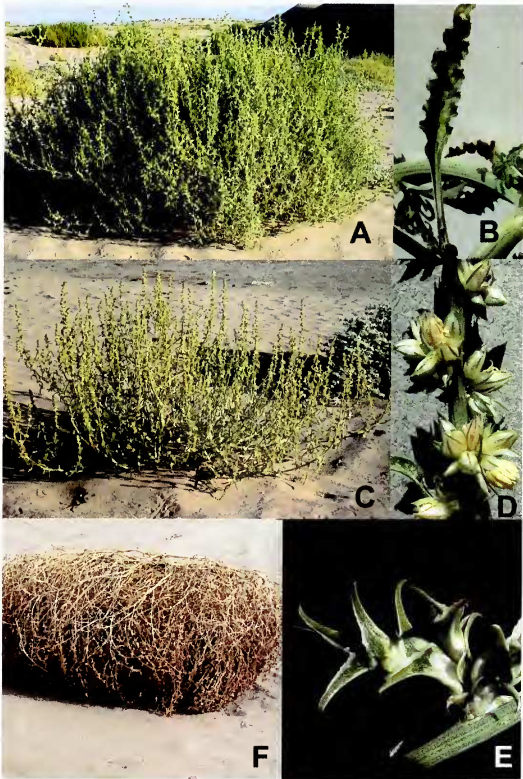


FIG. 1. *Amaranthus acanthobracteatus*. A. Pistillate plant, ca. 9 dm tall, 14 dm wide; note density of branching. B. Lower stem leaf, showing characteristic shape, long petiole, and strongly crisped blade margins. C. Staminate plant, ca. 8 dm tall, 1.2 dm wide; note open aspect of branching. D. Staminate globose dichasia with anthers. E. Pistillate inflorescence showing characteristic coloration and distal hook at the long bract tip. F. Post-mature pistillate plant, upside down—a tumbleweed.

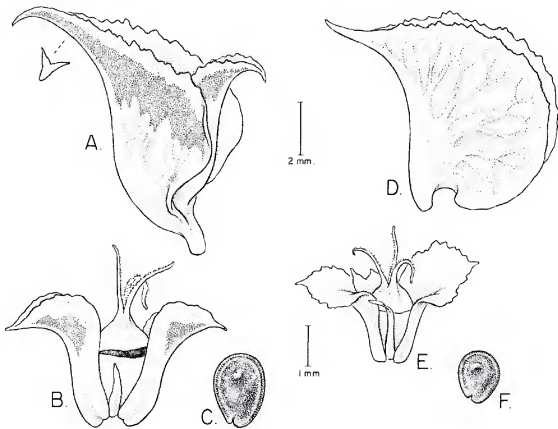


FIG. 2. Comparison of pistillate bracts, flowers, seeds of *Amaranthus acanthobracteatus* and *A. acanthochiton*. A-C: *A. acanthobracteatus*. Mature pistillate bracts, note narrow base, bract shape, and decurved tip. B. Mature fruit with associated perianth. C. Mature seed (all from *Henrickson 23209*). D-F: *A. acanthochiton*. D. Mature pistillate bract, note cordate base, folded reniform shape, and 6 straight terminal spine. Also note reticulate venation pattern on the bract side. E. Mature fruit with associated perianth. F. Mature seed (all from *Correll 26563*). The 2 mm scale is for mature pistillate bracts (A, D); the 1 mm scale is for B-C and E-F.

the outer margins thick membranous, white, entire or variously undulate to coarsely toothed, (0.3-)0.5-1.0 mm thick, the midvein white, with age the lower portion of the bracts becoming \pm spongy and sometimes the mid portions and margins also becoming spongy at maturity. Pistillate flowers with 2-3 sepals, the two marginal sepals largest, 3-4.5 mm long, with one larger than the other, both swollen-spongy and truncate at the base, the midribs green, excurrent, the whitish margins broad along the claw, and much expanded in the ovate blade below the acute-obtuse tip, the third sepal (when present) oblong, 0.8-2.7 mm long, abaxial. Ovary compressed; styles 2-3, 1.5-2.2 mm long, stigmatic and pilose along their inner surfaces. Staminate plants producing dichasial glomerules of 7-20+ staminate flowers at 2-15(-30) mm intervals along the upper stems, the glomerules subtended by narrow, crisped-margined leaves; bracts 1.2-2(-3.8) mm long, sepal like in structure, white scarious except along the green, excurrent midvein; sepals 5, oblong-elliptical, concavo-convex, 3.3-4.3

mm long, 1.2–1.4 mm wide, scarious except along the slender green midveins, rounded to 2-toothed at the tips, the midveins excurrent for 0.4–0.9 mm, the sepals strongly spreading at anthesis exposing the anthers; anthers 5, oblong, 2–2.2 mm long, \pm 0.7 mm wide (before anthesis), apiculate at the tip, yellow; post-anthesis anthers 1.5–1.7 mm long, the filaments initially 0.9 mm long, elongating to 2.0 mm at anthesis. Mature utricles compressed obovate, membranous, the body to 2.3 mm long, to 1.5 mm wide, with a visible circumscissile line of dehiscence in the distal third, the bottom portion smooth or rugose, the cap rugose or not, \pm beaked below the filiform styles. Seeds compressed obovoid, smooth, shiny, reddish-brown to reddish-black, 1.7–2.2 mm long, 1.3–1.6 mm wide and 0.8–1.05 mm thick, the embryo radicle pointing downward. Figs. 1, 2.

Additional collections: **Mexico, Chihuahua:** 36 air mi ENE of Escalon along trail to Esmeralda in Bolsón de Mapimí region of CDR scrub; dioecious annual on sandy knoll, near 26° 57'N, 103° 52'W, 3500 ft, 19 Sep 1972, *Henrickson 7755* (RSA); **Coahuila.** Sand dunes near Bilbao, 6 mi via Hwy 91, S of Mex Hwy 40, robust annual to 5 dm tall, in active dunes, 25° 25'N, 102° 55'W, 12 Sep 1984, *J.E. Bowers 2930*, with *T.L. Burgess, R.M. Turner* (ARIZ); \pm 37 air mi ESE of Torreon, on the sand dunes at Bilbao, on Hwy 68, about 10 mi NW of Viesca, near 25° 25'N, 102° 53'W, \pm 1000 m, 17 Oct 2002, *Henrickson 23171*, with *D. Riskind*; same locality, 13 Nov 2002, *Henrickson 23202, 23203, 23204, 23205, 23208, 23206, 23207*; all TEX and to be distributed.

There is no question that the new taxon is related to *Amaranthus acanthochiton*. Both are branched dioecious annuals of dune systems or sandy soils. In both the leaf blades are crispate; both have broadened and thickened pistillate bracts that fold over flowers and fruit. Both have two large pistillate sepals and 1–3 smaller ones.

But *Amaranthus acanthochiton* differs from the new taxon in several features (Fig. 2). The bracts of *A. acanthochiton* are more reniform in two-dimensional outline, typically cordate at the base, the sharp tip is straight or only slightly curved (but not distinctly deflexed at the tip), the green, mid-bract becomes thickened, spongy and develops a conspicuous raised-reticulate venation pattern on the outer base surface at maturity, the outer membranous margins are more strongly erose-crenate, typically much narrower, (0.4–0.6 mm wide), and the mature pistillate inflorescences are smaller, with fewer flowers. Also, in *Amaranthus acanthochiton*, the pistillate flowers have two larger marginal, clawed sepals, and may have 1–3 smaller, oblong, membranous sepals, 1 on one side, and 0–2 on the other face, however, in the smallest bracts, the pistillate flowers may just have 5 small, oblong sepals. Overall the sepals in *A. acanthochiton* are similar to those of the new species. But in some collections the blades of the larger sepals can become strongly expanded and develop a branching network of veins and have denticulate margins (Fig. 2 E). The larger sepals may also develop thickened, spongy bases at maturity as in the new taxon. Seeds in both are similar in orientation, color and shape, but are smaller (1.2–1.4 mm long, 0.95–1.05 mm wide) in *A. acanthochiton*.

Amaranthus acanthochiton is known from sandy flats and dunes from eastern Arizona (Navajo, Greenlee cos.); western New Mexico (San Juan, Rio Arriba, McKinley, Valencia, Catron, Socorro, Otero, Doña Ana, Luna, and Hidalgo cos.); Texas (El Paso, Hudspeth and Jeff Davis cos.) and northern Mexico, Chihuahua (Samalayuca Dunes south of Cd. Juarez) (Sauer 1955). Reports by Turner et al. (2003) of the species in Brewster, Presidio and Webb cos. have not been substantiated.

In *Amaranthus acanthobracteatus*, staminate plants have a much more open habit than the pistillate plants as can be seen in Fig. 1 A–B. Staminate plants branch at the base and the vertical lateral stems have fewer lateral branches creating an open growth form that would appear to allow for air flow between the stems and outward dispersal of pollen from the plants (Fig. 1C). The pistillate plants, in contrast, are more densely branched at the base and above; the plants forming a dense broadly globose growth form with the main lateral branches curving upward. That would presumably cause entering pollen to slow down, perhaps increasing the possibility of finding a suitable stigmatic surface.

The plants are well known to the local public and in wet years are very common on the dunes where they occur nearly exclusively with *Tidestromia lanuginosa* (Nutt.) Standl. The plants, along with those of *Tidestromia lanuginosa*, are gathered for animal feed by local townfolk. The local name for the plant is “Torillo” or “Herba Voladora,” the latter (flying herb) implying that the plants become tumbleweeds at maturity. The overall architecture of the pistillate plants is very similar to that of *Salsola*, (Chenopodiaceae) the Russian thistle, and a later trip to the type locality showed that mature plants indeed become tumbleweeds (Fig. 1F). However, unlike *Salsola*, where a distinct abscission layer forms at the stem-root junction, no distinct abscission layer forms between roots and stem. Rather, as the plants mature, their fleshy roots die, dry out, and eventually break away, leaving the broadly globose plants to tumble across the dunes dispersing the pistillate infructescences and seeds.

ACKNOWLEDGMENTS

I thank Neil Harriman for the Latin translation, Thomas Wendt and Fernando Chiang for the Spanish translation of the abstract, Bobbi Angell for Figure 2, ARIZ, and SRSC for loan of specimens, David Riskind for causing the initial visit the dunes at Bilbao, which I later hit at the peak of flower, and the Plant Resources Center of the University of Texas, Austin for use of facilities.

REFERENCES

- BENTHAM, G. and J.D. HOOKER. 1880. *Amarantaceae*. In: *Genera plantarum*. Vol 3. Reeves & Co., London. Pp. 20–43.
- CORRELL, D.S. and M.C. JOHNSTON. 1970. *Manual of the vascular plants of Texas*. Texas Research Foundation, Renner.

- MARTIN, W.C. and C.R. HUTCHINS. 1980. A flora of New Mexico. 2 Vols. J. Cramer, Vaduz.
- MOSYAKIN, S.L. and K.R. ROBINSON. 2003. *Amaranthus*. In: Fl. N. Amer. 4:410–435.
- MURRAY, M.J. 1940. The genetics of sex determination in the family *Amaranthaceae*. *Genetics* 25:409–431
- SAUER, J. 1955. Revision of the dioecious *Amaranthus*. *Madroño* 13:5–46.
- SAUER, J. 1957. Recent migration and evolution of the dioecious *Amaranthus*. *Evolution* 11: 11–31.
- SCHINZ, H. 1934. *Amaranthaceae*. In: A. Engler & K. Prantl. *Die natürlichen pflanzenfamilien* 16c:7–85.
- STANDLEY, P.C. 1917. *Amaranthaceae*. In: *N. Amer. fl.* 21(2):95–169.
- TURNER, B.L., H. NICHOLS, G. DENNY, and O. DORON. 2003. *Atlas of vascular plants of Texas*, Vol. 1., *Sida*, Bot. Misc. 24, Botanical Research Institute of Texas.